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Chapter 2

Reputation, Gossip, and Human Cooperation

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2 Reputation, Gossip, and Human Cooperation

Abstract

Why do people cooperate? We address this classic question by analyzing and discussing the role of reputation: people cooperate to maintain a positive reputation in their social environment. Reputation is a key element fueling a system of indirect reciprocity, where cooperators establish a good reputation and are thus more likely to receive future benefits from third parties. The tendencies to monitor, spread, and manage each other's reputation help explain the abundance of human cooperation with unrelated strangers. We review research on the phenomenon of reputation-based cooperation in the domains of how people manage their reputation in response to varying cues of reputation, when reputation can promote cooperation, and individual differences in reputation management. We also propose three directions for future research: group stability and reputation-based cooperation, solutions to cope with noise and biased reputation, and the relative efficiency of positive versus negative reputation systems.

Keywords: reputation, gossip, indirect reciprocity, evolution, cooperation

“It takes 20 years to build a reputation and five minutes to ruin it. If you think about that, you’ll do things differently.” — Warren Buffett

Our daily lives are rife with social dilemmas—situations that involve a conflict between one’s short-term personal interest and the long-term collective interest (Van Lange, Joireman, Parks, & Van Dijk, 2013). Such social dilemmas can arise at home (e.g., keeping the house clean), in the workplace (e.g., organizational citizenship behaviors), and involve large-scale societal issues (e.g., resource depletion, environmental protection, and intergroup conflict). Promoting cooperation in these situations is challenging because each individual has an incentive to maximize their own interest, but doing so harms the collective. Nevertheless, humans display a considerable amount of cooperation across these diverse situations. Why do people persistently cooperate for the welfare of others?

Reputation is a fundamental reason why people cooperate in social dilemmas, even among strangers. People evaluate others’ behavior, share that information with third parties (i.e., gossip), and behave in ways to manage their own reputation in social interactions. In social dilemma situations, non-cooperative behavior can lead to a bad reputation and future ostracism, whereas cooperation can secure a good reputation and attract valuable partners and allies. Indeed, much research demonstrates that reputation can promote cooperation, and ultimately solve the “tragedy of the commons” (Leimar & Hammerstein,

2001; Milinski, Semmann, & Krambeck, 2002b; Panchanathan & Boyd, 2004).

The prosocial benefits of reputation have received increasing attention in recent years across disciplines, such as psychology (Anderson & Shirako, 2008), sociology (Simpson & Willer, 2008), anthropology (Panchanathan & Boyd, 2004), and evolutionary biology (Nowak & Sigmund, 2005). Key questions that have been addressed include: How do people adjust their behavior to manage their reputation? When does reputation lead to cooperation? Who cares about reputation? In this article, we first explain the theoretical framework of reputation-based cooperation, followed by a review of research on these three questions, and finally discuss some promising future research directions.

Reputation-Based Cooperation: An Evolutionary Perspective

Reputation represents a set of collective beliefs, perceptions, or evaluative judgments about someone among members within a community (Bromley, 1993; Emler, 1990; Sperber & Baumard, 2012). From an evolutionary psychology perspective, humans may have evolved adaptations to identify opportunities to manage their reputation, because a cooperative reputation would lead to fitness benefits (e.g., resources, attracting partners) whereas an uncooperative reputation involved fitness costs (e.g., social exclusion) in the ancestral past (Cosmides & Tooby, 2013; Hogan & Briggs, 1986; Hogan, Jones, & Cheek, 1985; Sperber & Baumard, 2012).

Several evolutionary theories can explain why reputation facilitates cooperation. One is the system of indirect reciprocity based on reputation. That is, people who cooperate tend to earn a good reputation and this promotes the acquisition of future indirect benefits from third parties (Alexander, 1987; Nowak & Sigmund, 2005). Indirect reciprocity is exemplified by “I help you now, and someone else will help me in the future”, and is different from direct reciprocity that involves repeated interactions between the same persons (i.e., I help you now, and you will help me in the future). Agent-based modeling (ABM) can be used to test the relative success of cooperation in a population of agents that can communicate and interact with each other. The ABM approach simulates individuals as autonomous agents that vary in attributes or decision rules (e.g., always cooperate, always defect, or conditionally cooperate with others with a good reputation). These agents interact with others in each generation, and the resulting payoffs affect their reproductive success, and so their number of offspring (and corresponding decision rules) in the next generation. This process is repeated for many generations (for a review, see Rand & Nowak, 2013; Smith & Conrey, 2007). Thus, these models can help us observe which behavioral strategies can evolve and become more common in a population. Indeed, agent-based models of evolutionary dynamics find that cooperation can evolve in a population when social interactions are structured according to indirect reciprocity (i.e., individuals who condition their cooperation on others’ reputation are more reproductively successful across generations than completely selfish individuals) (Leimar & Hammerstein, 2001;

Nowak & Sigmund, 2005).

Another theory is competitive altruism (i.e., reputation-based partner selection), which demonstrates that people with a cooperative reputation are more likely to attract other cooperative partners in future interactions, and the most cooperative person will receive more benefits than less cooperative ones (Barclay, 2004; Barclay & Willer, 2007; Van Vugt, Roberts, & Hardy, 2007). Thus, when there is competition to be chosen as partners, people should be motivated to be more cooperative than others.

Similarly, costly signaling theory (CST, Zahavi & Zahavi, 1997) posits that behavior or traits that are costly and not easy to fake can reliably signal one's quality. Thus, individually costly cooperation signals (a) one's willingness and ability to incur a cost to increase others' welfare, and (b) one's quality as a potential mate or coalition partner in social interactions. Importantly, to classify a particular act as an honest signal, there should be an audience to perceive it as cooperative and further transmit this information to others (Van Vugt et al., 2007).

Despite some nuanced differences in the forms of future benefits, these theories all suggest that (a) one's immediate (un)cooperative behavior functions to build a reputation, which leads to future fitness benefits or costs (resources or attraction to partners), and (b) people may have evolved to adjust their cooperation when their reputation is at stake, especially when this reputation may affect future interactions. Importantly, an evolutionary framework does not assume that people are automatically and naturally selfish. Evolutionary processes that operate on "selfish" genes can shape psychological mechanisms in a species that promote cooperation and altruism (Bowles & Gintis, 2011). For example, humans may have evolved some psychological adaptations to identify opportunities to cooperate to secure a good reputation. Such evolved psychological mechanisms may influence self-presentation (Baumeister & Tice, 1986), be intuitive and unconscious (Hogan & Briggs, 1986; Hogan et al., 1985), and not necessarily involve rational calculation of indirect benefits (Levine & Kurzban, 2006; Wu, Balliet, & Van Lange, 2015, 2016a). Next, we discuss how and when people conditionally cooperate to maintain a positive reputation.

How Do People Manage Their Reputation? Cues of Reputation and Cooperation

One adaptive problem is identifying when cooperation affects reputation and leads to indirect benefits. Indeed, people may often be unaware of when others can observe or gossip about their behavior, and how this chance to observe or gossip affects their reputation and potential future benefits. To secure a good reputation, people may either conceal or withhold information relevant to their reputation (e.g., Piazza & Bering, 2010), or adjust their behavior in response to situational cues that suggest reputational consequences of their behavior. Such cues, in turn, can activate reputational concern and motivate cooperation (Wu et al., 2015, 2016a). Indeed, increasing evidence suggests that explicit or implicit situational cues that serve as reminders of one's reputation can promote cooperation. Two im-

portant cues of reputation that promote cooperation include: social visibility and gossip.

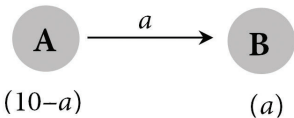
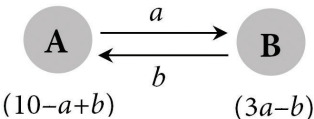
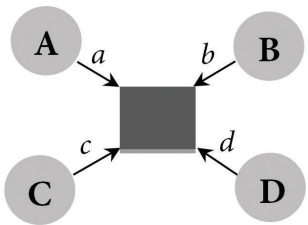
Social Visibility

Costly signaling theory suggests that people should be more cooperative in public situations when they can enhance their reputation through costly cooperation (Gintis, Smith, & Bowles, 2001; Smith & Bliege Bird, 2000). Indeed, considerable research using economic games (see Table 2.1) or other approach supports the prediction that social visibility promotes cooperation, whereas anonymity undermines it. For example, people are more cooperative in public goods games when their behavior and photos are visible to their group members (Andreoni & Petrie, 2004), when future partners know their behavior (Milinski et al., 2002b), or when there is a third-party observer (Filiz-Ozbay & Ozbay, 2013). Contributions increase in publicly visible (vs. anonymous) situations, even when the public good is already provided or not attainable (Van Vugt & Hardy, 2010). Complementary field research shows that people increase their prosocial acts when their behavior is public (Ariely, Bracha, & Meier, 2009). People also have a stronger preference for green products while shopping in a public store (vs. “privately” online at home) (Griskevicius, Tybur, & Van den Bergh, 2010). Other forms of cooperation, such as altruistic punishment of norm violators, are also promoted by the presence of observers (Kurzban, DeScioli, & O’Brien, 2007; Piazza & Bering, 2008b). Interestingly, even five-year-olds are more generous when their behavior is disclosed to their partner (Leimgruber, Shaw, Santos & Olson, 2012). Similarly, 5- to 6-year-olds showed greater resistance to cheating when they believed they were being watched by another person compared to no observer (Piazza, Bering, & Ingram, 2011). Thus, young children conditionally cooperate in response to cues of social visibility, and this precedes an understanding of reputation (Hill & Pillow, 2006).

While people adjust their behavior in response to explicit cues of social visibility, they are also sensitive to implicit and false cues of reputation that involve no cost for noncooperation. Some research reveals that subtle cues of being watched—by a pair of eye images—can deter free riding and promote cooperation. For example, eyespots (vs. no eyespots) on a desktop can make people more generous in a dictator game (Haley & Fessler, 2005), and this “watching eyes effect” has been replicated using different paradigms (e.g., Oda, Niwa, Honma, & Hiraishi, 2011; Rigdon, Ishii, Watabe, & Kitayama, 2009). Recent evidence suggests that this effect might be driven by expected reward from a good reputation, not fear of punishment (Oda et al., 2011). Cues of watching eyes can even promote prosociality or normative behavior in the field. For example, exposure to eye images may increase monetary contribution used for drinks in a university coffee room and charitable donations (Bateson, Nettle, & Roberts, 2006; Powell, Roberts, & Nettle, 2012), reduce littering at cafeterias and bicycle theft (Ernest-Jones, Nettle, & Bateson, 2011; Nettle, Nott, & Bateson, 2012). Other subtle reminders of being watched or cues that elicit public awareness can also increase low-cost helping and even reverse the bystander effect. For example,

making one's name salient after login or putting a webcam on top of a computer monitor makes people more likely to help others online in the presence of bystanders (Van Bommel, Van Prooijen, Elffers, & Van Lange, 2012).

Table 2.1
Three Commonly Used Economic Games in Behavioral Experiments

Game type	Decision path	Game description
Dictator game ($a \leq 10$)		The allocator (A) sends a portion (a) of their endowment (10) to the recipient (B). The recipient (B) has no decision to make.
Trust game ($a \leq 10, b \leq 3a$)		The investor (A) sends a portion (a) of their endowment (10) to the responder (B). Then the responder (B) receives tripled amount of the portion ($3a$) and sends some amount (b) back to the investor (A). The amount sent back is not tripled.
Public goods game ($a, b, c, d \leq 10, 1 < k < 4$)		Group members (A, B, C, and D) simultaneously contribute a portion (a, b, c and d) of their endowment (10) to the group account and keep the remaining to their private account. Total contribution is then multiplied by k , and evenly divided among all group members.

Note. A, B, C, and D refer to the persons interacting in the game. The initial endowment is 10 monetary units (MU) for A in the dictator game and trust game, and for A, B, C, and D in the public goods game. Other economic games capture similar dynamics between partners or group members.

Despite considerable research on eye images during the last decade, there is debate whether the effect is robust and generalizable across situations. A recent meta-analysis suggests that watching eyes do not significantly increase the amount of generosity in dictator games (a continuous variable, $d = 0.04$), but increase the probability that participants give something rather than nothing to the recipient (a dichotomous variable, $d = 0.18$) (Nettle et al., 2013). Other research suggests that eyes only increase prosociality when the eyes are wide open and directly watching (Manesi, Van Lange, & Pollet, 2016) or when there is strong chronic public self-awareness (Pfafftheicher & Keller, 2015). Also,

such “watching eyes effect” on cooperation might be transient (Sparks & Barclay, 2013), and may not exist in some situations, such as anonymous online situations (Raihani & Bshary, 2012), or among young children of ages five and eight (Vogt, Efferson, Berger, & Fehr, 2015).

Apart from cues that one’s behavior is observed or disclosed to others, people’s social connectedness in social networks may also increase their social visibility. More socially connected people tend to receive more attention and potential gossip by others in communities, and so develop a reputation more tightly linked to their history of cooperative and selfish behavior (Anderson & Shirako, 2008). Similarly, these people may be more exposed and vulnerable to having their uncooperative behavior translate into a bad reputation. Thus, people with more social network connections may be more sensitive to the reputational consequences of their behavior, and so either try to increase their anonymity, or be more cooperative to enhance a good reputation—a topic worthy of future research.

Gossip

While people may develop a firsthand reputation from their interaction partners or observers’ evaluations, they also tend to develop a secondhand reputation when these evaluations are further shared and spread with other third parties through gossip (Anderson & Shirako, 2008; Foster, 2004). Indeed, even 3- to 4-year-olds tend to report others’ norm violations to third parties in social interactions (Ingram & Bering, 2010). Although often considered as anti-social, gossip serves many prosocial functions. In particular, gossip helps spread information about free riders and cheaters, maintain group norms, and increase within-group cooperation (Dunbar, 2004). Indeed, people care about their reputation and adjust their behavior when gossip may affect their reputation and potential costs and benefits in future interactions (Feinberg, Willer, Stellar, & Keltner, 2012; Piazza & Bering, 2008a; Wu et al., 2015, 2016a).

People tend to increase their levels of cooperation in response to the possibility of gossip and reputation spreading. For example, gossip promotes generosity when people can enhance their reputation by making themselves known to potential gossip recipients (Piazza & Bering, 2008a). People also contribute more to a group when group members have a strong tendency to gossip (Beersma & Van Kleef, 2011). Indeed, people tend to gossip about others’ uncooperative behavior and be more cooperative themselves in social interactions when their partners can gossip (Feinberg, Willer et al., 2012). Gossip also facilitates people to choose cooperative partners and avoid cheaters. Indeed, cooperation substantially increases when people can select partners and ostracize free riders based on gossip, compared to when only gossip was possible (Feinberg, Willer, & Schultz, 2014).

Meanwhile, people tend to condition their own cooperation on gossip about others, with positive (vs. negative) gossip about others promoting greater cooperation with those others, and this effect still exists when people can directly observe others’ behavior (Som-

merfeld, Krambeck, Semmann, & Milinski, 2007). Despite the temptation to manipulate gossip and transmit biased reputation about others to benefit oneself, people who spread biased reputation are vulnerable to punishment by the gossip targets and recipients, who may eventually discover the deception (Giardini, 2012). Importantly, humans may have some psychological adaptations to assess gossip veracity from situational cues, such as multiple sources of gossip (i.e., frequency of the same information received from others) and independence among gossipers (Hess & Hagen, 2006). Overall, gossip provides a low-cost social control system to promote cooperation without lowering its efficiency (Feinberg, Cheng, & Willer, 2012; Giardini & Conte, 2012; Wu, Balliet, Van Lange, 2016b).

When Does Reputation Promote Cooperation?

The effectiveness of reputation in promoting cooperation depends on several situational factors, including shadow of the future (i.e., anticipation of future interactions with others who know one's reputation) and group size.

Shadow of the Future

Cooperators who sacrifice their immediate interest for others' welfare establish a good reputation, which can result in future indirect benefits from third parties (Nowak & Sigmund, 2005). Thus, people should be sensitive to reputation and adjust their behavior when they perceive a "shadow of the future" (Barclay, 2012). Do people invariably cooperate whenever their reputation is at stake, or only cooperate when reputation resulting from their behavior affects future indirect benefits? To answer this question, Wu et al (2015) asked participants to allocate resources to a recipient in a dictator game, and then interact with another person in a trust game. They found that participants were more generous when the recipient could gossip to their future partner in the trust game, compared to gossip to an irrelevant person they would never meet or a situation in which gossip was impossible. Moreover, gossip to an irrelevant person did not increase generosity compared to when gossip was impossible. Similarly, a large-scale field experiment on the prevention of blackouts found that house owners (vs. temporary renters) and people living in apartments (vs. houses) were more likely to participate in a demand response program to help prevent blackouts when others would know their behavior and identity (Yoeli, Hoffman, Rand, & Nowak, 2013). This is because house owners and people living in apartments are more likely to have future interactions with others around their living area, and so their reputation contains long-term indirect costs and benefits. Together, these findings suggest that people are more concerned about their reputation and increase their cooperation when they anticipate future interactions with those who would know their reputation.

While people can never ensure whom they will interact with in the future (Delton, Krasnow, Cosmides, & Tooby, 2011), other situational cues might help to infer whether reputation leads to future consequences. For example, group membership may imply po-

tential future interactions, because people interact with in-group members over an extended period, and one's current cooperation may be rewarded in the future by other in-group members (Yamagishi, & Kiyonari, 2000). Indeed, people behave more cooperatively toward in-group members, but not out-group members, when their reputation is at stake (Mifune, Hashimoto, & Yamagishi, 2010). Importantly, people usually belong to different groups that constitute larger social networks. Thus, when group membership is not a salient cue, others' network connections may be an important cue for people to efficiently manage their reputation, and acquire future indirect benefits. Indeed, people tend to be more cooperative toward well-connected members within their social networks (Curry & Dunbar, 2011), and people are also more generous toward others who have more social connections and thus more gossip capacity within their social networks (Wu et al., 2016a). This might occur because more socially connected people have greater potential to spread others' reputation, and so reputation resulting from behavior toward well-connected people can be more rewarding (and damaging) to one's reputation.

Group Size

Indirect reciprocity is often claimed to promote cooperation in large groups of genetically unrelated individuals. Although large groups can reduce perceptions of group efficiency and cooperation, there exist mixed findings on how group size affects cooperation (Barcelo & Capraro, 2015; Capraro & Barcelo, 2015; Kerr, 1989; Suzuki & Akiyama, 2005). Yet, a recent meta-analysis found a small negative relation between group size and cooperation (Peperkoorn, Balliet, & Van Lange, 2015). Can gossip and reputation prevent this decline in cooperation in larger groups?

An increased group size makes it difficult to directly monitor others' behavior, and easier for free riders to exploit others without being noticed. Thus, larger groups may be more vulnerable to free riding, making reputation-based cooperation less likely to occur. Computer simulations demonstrate that cooperation decreases in larger groups, even when incorporating the effect of cooperative reputation (dos Santos & Wedekind, 2015; Suzuki & Akiyama, 2005). However, reputation based on punishment can sustain cooperation in larger groups, because assessing others' punishment reputation by merely monitoring a few punishers is less error-prone or cognitively demanding (dos Santos & Wedekind, 2015). Importantly, this may not represent real-life situations, because previous behavioral information of the punishers and the punished (compared to others) is also needed to accurately assess others' punishment reputation.

Gossip and reputation spreading may promote cooperation in larger groups, when group members can freely exchange each other's reputation. Larger groups may potentially reduce negative noise and biased reputation if people can receive gossip from more group members and assess gossip veracity more accurately from different sources (Hess & Hagen, 2006). Some field evidence shows that medium-sized groups are more likely

to provide third-party monitoring and induce higher contributions than smaller groups (Agrawal & Goyal, 2001). A recent computer simulation also shows that gossip-based strategies (e.g., choosing group members based on others' reputation) are more effective in promoting cooperation in larger groups (Giardini, Paolucci, Adamatti, & Conte, 2015).

Larger groups also create new problems of finding reliable partners and advertising oneself as a trustworthy partner. Groups contain networks of indirect reciprocity, where cooperators tend to be selected as coalition partners and receive future benefits from in-group members (Nowak & Sigmund, 2005; Yamagishi & Kiyonari, 2000). The freedom to form coalitions with cooperators and ostracize free riders creates selection advantages for cooperation, such that the most cooperative people are more successful in the long run, through the process of competitive altruism (Van Vugt et al., 2007). Thus, it is extremely important to successfully advertise oneself as a more cooperative partner when there is competition over a good reputation, and less chance to be chosen as potential partners in larger groups.

Who Cares about Reputation? Individual Differences in Reputation Management

Although reputation facilitates people to gain future indirect benefits within groups and social networks, people may not value their reputation to the same extent. Here we discuss two individual difference factors that can influence reputation management: social value orientation and life history strategies.

Social Value Orientation

Social value orientation (SVO) represents one's dispositional preference in resource allocation between self and others in interdependent situations (Van Lange, Otten, De Bruin, & Joireman, 1997). Prosocials prefer to maximize collective interest and outcome equality, whereas proselves prefer to maximize their own interests (Van Lange, 1999). Prosocials tend to exhibit higher cooperation levels than proselves in both social dilemma games and real-life helping situations (Balliet, Parks, & Joireman, 2009; McClintock & Allison, 1989; Van Lange, Schippers, & Balliet, 2011). Importantly, proselves are also strategically more cooperative to gain direct or indirect benefits from others. For example, compared to prosocials, proselves are more strongly motivated to cooperate in the first-round interaction when they anticipate repeated (vs. single) interactions with another person (Van Lange, Klapwijk, & Van Munster, 2011). Similarly, given that a good reputation brings about future indirect benefits from others, people with different SVOs should respond differently to cues of reputation. Indeed, research shows that proselves tend to display a larger increase in cooperation than prosocials when their future partner would know about their reputation, compared to situations with no reputational incentive (Feinberg, Willer, et al., 2012; Simpson & Willer, 2008; Wu et al., 2015). Thus, reputation seems to be a more effective solution to enhance cooperation among people who only care about their own

interests. Importantly, this process does not necessarily involve conscious calculation of the specific benefits one could gain from a good reputation, because recent evidence suggests that expected indirect benefits (e.g., benefits from one's future partners who know about one's reputation) do not explain the observed effects of gossip and reputation on cooperation (Wu et al., 2015).

Life History Strategies

According to life history theory, all organisms have to face trade-offs in allocating limited resources to potentially conflicting fitness-enhancing activities, and the allocation decisions constitute one's life history strategy that varies from "fast" (e.g., early maturation and reproduction, small body size, and short life span) to "slow" (e.g., late maturation and reproduction, large body size, and long life span) (Del Giudice, Gangestad, & Kaplan, 2015). Life history strategies have important psychological and behavioral consequences, such as risk taking, aggression, mating, and especially behaviors that involve future reward (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Figueredo et al., 2006; Griskevicius, Tybur, Delton, & Robertson, 2011). Indeed, people with slower strategies value future benefits more than immediate reward (Griskevicius et al., 2013; Griskevicius et al., 2011). Given that reputation leads to delayed benefits, people who devalue the future may be less sensitive to reputation. Thus, life history strategies might affect the extent to which people care about their reputation and future fitness benefits, and further influence long-term cooperation and reciprocity (Barclay, 2012; Del Giudice et al., 2015).

Variations in life history strategies are influenced by different ecological factors: (a) early-life experiences, in particular childhood environmental harshness and unpredictability (e.g., resource-scarce or dangerous environments) (Belsky, Schlomer, & Ellis, 2012; Frankenhuis, Panchanathan, & Nettle, 2016), and (b) current stress levels (e.g., mortality rates) (Ellis et al., 2009). Indeed, harsh and unpredictable (vs. benign and predictable) childhood environments sensitize people to adopt faster (vs. slower) life history strategies. For example, experienced unpredictability in early childhood (i.e., age 0-5) leads to more aggression associated with faster strategies at age 23 (Simpson, Griskevicius, Kuo, Sung, & Collins, 2012). Other research found that people from deprived (vs. affluent) neighborhoods with shorter expected life span display faster life history strategies (e.g., younger age at first childbirth, shorter breastfeeding duration, and higher reproductive rates) (Nettle, 2010), and are less cooperative in dictator games and real-life situations (Nettle, Colléony, & Cockerill, 2011). Importantly, deprived neighborhoods are characterized by exposures to environmental harshness and cues of short life expectancies that are important for the emergence of faster life history strategies, and these characteristics cannot be treated equally with individuals' current socioeconomic status (e.g., Piff, Kraus, Côté, Cheng, & Keltner, 2010). Indeed, research shows that early experience (e.g., childhood SES) influences one's contingent responses to subtle cues of threats in the current environment,

whereas current SES does not have such effect (Griskevicius et al., 2013; Griskevicius et al., 2011). To conclude, there is need for future research to further test (a) how life history strategies develop from variations in early-life environments, and (b) whether people with faster or slower strategies differ in their concern for reputation and the long-term indirect benefits of cooperation.

Broader Implications and Future Directions

The utility of reputation systems in promoting cooperation contains broad implications for organizations and societies. Indeed, much research has attempted to understand effective solutions that promote cooperation, such as punishment and reward (Balliet, Mulder, & Van Lange, 2011; Fehr & Gächter, 2002a). These incentive systems are costly and are in many circumstances inefficient (Dreber, Rand, Fudenberg, & Nowak, 2008; Egas & Riedl, 2008). For example, punishment may undermine one's intrinsic motivation to cooperate (Fehr & Gächter, 2002b; Nelissen & Mulder, 2013), make people less cooperative or trusting once punishment is removed in future interactions (Mulder, Van Dijk, De Cremer, & Wilke, 2006), and create second-order free rider problems (i.e., some people do not pay a cost to punish noncooperators, but take advantage of the benefits from others' costly punishment of noncooperators).

Thus, material incentives may only increase (involuntary) cooperation in the short term, but have long-term negative consequences. Moreover, the tendencies to punish noncooperators that occur in behavioral experiments (Fehr & Gächter, 2002a) may be uncommon in real-life situations, because peer punishment is costly and may lead to retaliation (Guala, 2012; Sigmund, 2007). In contrast, gossip and reputation monitoring may increase cooperation in an effective and efficient way (Panchanathan & Boyd, 2004). Given that it is harder to gain but easier to lose a good reputation (Yaniv & Kleinberger, 2000), people should be motivated to (a) build a cooperative reputation when their reputation is at stake, and (b) further maintain their reputation through cooperation in future interactions even with no salient reputational cues. Thus, reputation may potentially facilitate long-term voluntary cooperation. Indeed, such reputation systems are already in place in several contexts, such as online service marketplaces (Jøsang, Ismail, & Boyd, 2007; Moreno & Terwiesch, 2014). Rather than establishing costly sanctioning systems, it may be useful to think creatively about more informal and less costly reputation systems (e.g., online platforms). To optimize the utility of reputation in promoting cooperation, we propose three important directions for future research: (a) group stability and reputation-based cooperation, (b) noise, biased reputation, and efficiency of reputation systems, and (c) positive versus negative reputation systems.

Group Stability and Reputation-Based Cooperation

People often face the tradeoff between (a) within-group competition for their own ben-

efits, and (b) within-group cooperation to increase group performance and stability relative to other groups. Intergroup competition decreases the conflict between personal and collective interest, and facilitates cooperation within groups (Bornstein & Ben-Yossef, 1994). Importantly, in intergroup competition, groups vary in how well they perform, and thus how likely they will persist and survive (Lahti & Weinstein, 2005). Thus, intergroup competition and the resulting group stability (i.e., the likelihood that a group will persist) may have different consequences: (a) when the group is relatively stable, within-group competition is beneficial for oneself; (b) when the group is unstable, cooperation becomes beneficial only if other group members also cooperate. Thus, to ensure that others also cooperate, people should monitor each other's behavior and cooperate themselves in response to mutual monitoring (e.g., gossip). By doing this, cooperators can decrease their vulnerability to exploitation by others. Future research may investigate whether the use of gossip and reputation systems vary by group stability in intergroup competition.

Noise, Biased Reputation, and the Efficiency of Reputation Systems

Noise—unintended errors that cause discrepancies between one's intended and actual outcomes—often occurs during social interactions or communication (e.g., reputation spreading), and so affect how we evaluate others' behavior (e.g., Tazelaar, Van Lange, & Ouwerkerk, 2004). A typical example of noise is being late for a meeting because of an unexpected traffic jam. In particular, noise may lead to (a) discrepancy between one's intended behavior and actual behavior, and (b) biased reputation that is inconsistent with one's actual behavior. Indeed, noise in either form can negatively affect cooperation. Past research has focused on solutions (e.g., communication) to overcome negative noise in social interactions (e.g., Tazelaar et al., 2004), but how noise can result in biased reputations has received less attention. Unintended errors in reputation transmission can result in either (a) biased positive reputation—those believed to be cooperators are actually cheaters, or (b) biased negative reputation—those believed to be cheaters are actually cooperators (Paolucci, 2000). Biased reputation can have severe consequences to individuals in social interactions. For example, free riders may utilize a biased positive reputation to mislead and exploit cooperators. Cooperators with a biased negative reputation may be subject to a self-fulfilling prophecy: people who act upon such noncooperative impressions are likely not to cooperate themselves, thereby inviting noncooperation and confirming their impressions (Kelley & Stahelski, 1970). Thus, it is important for future research to investigate these negative consequences caused by one's own or others' biased reputation, and explore effective strategies to cope with noise and biased reputation.

Positive Versus Negative Reputation Systems

In social interactions, people are motivated to gain a good reputation and avoid a bad reputation. They also condition their behavior on others' reputation: cooperate with others

with a good reputation, and avoid interactions with others with a bad reputation. Similar with financial reward or punishment, a reputation system can be either positive or negative, depending on whether people only (or mainly) transmit positive or negative reputational information about each other (Whitmeyer, 2000). While people tend to gossip negatively about others for prosocial purpose (Feinberg, Willer, et al., 2012), positive gossipers seem to be perceived as more likable (Farley, 2011). Indeed, positive reputation systems (e.g., awards, certificates, and positive reviews) seem to be more common in modern societies, and may be more efficient than negative reputation systems in promoting trust and cooperation. This is partly because (a) reminders of others' bad reputation may suggest one's vulnerability of exploitation, and make people less likely to trust and cooperate with others in the future, whereas (b) cooperators with a good reputation can also serve as examples to motivate others to cooperate, and so can potentially create more trustful and cooperative social networks. Testing the relative effectiveness and efficiency of positive and negative reputation systems is a critical topic for future research.

Concluding Remarks

One of the greatest scientific challenges is to understand why people cooperate—in particular, with friends, colleagues, but also with strangers. Indeed, recent research has provided convergent evidence for reputation as a fundamental route to human cooperation. People manage, spread, and respond to their own and others' reputation in both online and real-life social networks. As Warren Buffett aptly notes, it is harder to build a good reputation than to ruin it, and if everybody thinks about it prior to their behavior, we would have a more well-functioning and cooperative society. In other words, institutions (e.g., online social media) that support and facilitate gossip and reputation monitoring are likely to promote trust and cooperation. Although individuals may not always prefer the presence of gossip and reputation monitoring, collectives are bound to value such mechanisms, because reputation is one of the most cost-efficient ways to promote cooperation, even among strangers in large groups and social networks.

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